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GM dexos® 1 Gen 3

Base Oil Interchange (BOI) and Viscosity Grade Read Across (VGRA)

Rules

A	GENERAL

Minor Modifications

Guidelines for minor formulation modifications generally follow Appendix H, ACC Code of Practice **Most Recent Revision (MRR).** However, the definition and purpose of minor modifications must be agreed to by GM. Test sponsors are encouraged to notify GM of a presumed minor modification before proceeding with development and testing of a candidate to ensure it will be deemed suitable for support of licensure by GM at the time of application.

Quality Audits

Licensed dexos® oil formulations are subject to field quality audits. The licensee is responsible for ensuring that all engine and bench test results meet specification and for the actual performance of the licensed product sold as factory fill and/or service fill oil whether or not BOI or VGRA are used. The licensee is required to cooperate with field audit activities, develop an action plan to rectify any nonconformance that may be identified during such audit up to any including requalifying formulations for the failed test. GM reserves the right to revoke a license for a pattern of nonconformance.

All non-GM developed tests used to qualify a candidate for dexos® licensing must be developed, run and reported in accordance with the following guidelines and standards:

API 1509 (MRR)

Annex A-S

ACC -Petroleum Additives Product Approval Code of Practice (MRR)

Appendices A-K

ATIEL – Code of Practice (MRR)

Appendices A-E

General Rules

1) All performance (GM Engine and Sequence) test data used to support dexos® licensure must be from tests that were completed (EOT Date) within five (5) years of the date of FSP submission for license.

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2) All core Engine Oil formulas most have at least one GM engine test completed and passed on the formula to be granted a license.

3) Base Oils with less than 95% saturates (ASTM D7419) will not be permitted in dexos® licensed products.

4) All requests of the dexos® Committee to apply BOI/VGRA rules or forgo testing which the requestor believes are permitted by applicable industry guidelines (i.e. ACC, API, ATEIL, etc.) must be accompanied by a reference to and citation from the applicable supporting guidelines.

5) All data used to seek and support relief of candidate testing (level 2, minor mods, etc.) must be accompanied by a full test report when presented. Requests which solely indicate "Pass" or "Fail" results for supporting data will not be considered.

6) All Boosters must be identified by a unique code and that code must be used whenever that booster is documented in any dexos® related system (TMC, TRC, etc.).

7) All Boosters must be defined in all TMC, TRC systems as to purpose (more than one if appropriate), function and general chemical category for all components.

8) Candidate data sets that contain a failing engine/performance test shall not be used to support a dexos® application. However, candidates that achieve a passing result using MTAC can be used for Read Across.

9) To utilize GMOD and GMTC data in support of Gen 3 licensure, pre-test NOACK and post test HTHS@150C must be reported. Exceptions are passing GMOD tests which meet the Read Across rules for the test and passing GMTC tests with TCO of 4.5% or less. All GMOD and GMTC tests run after 9-16-2020 must include new fluid NOACK and post-test HTHS data.

10) When reading test data from a non-dexos®/API licensed formula for the purpose of achieving dexos® licensure, the tested formula and data must be ACC registered and the sponsor must ensure that it is capable of meeting all current dexos® license tests. Should it be requested the sponsor shall provide GM with evidence that the tested formula meets all pertinent dexos® license tests.

B	**Base Oil Interchange (BOI)**

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Rules

BOI is offered to dexos® oil manufacturers, marketers, and blenders at the sole discretion of GM to promote lower testing costs, lower production costs, enhance flexibility in formulating and to increase security of supply among other benefits and efficiencies. BOI reflects the current state of knowledge in the industry and GM's experience with dexos® formulations.

API BOI rules (API 1509 E/F) are permitted for ASTM/CEC performance tests run to qualify dexos® oil formulations under the new dexos® 1 Gen 3:2020 specification. BOI is generally not applicable to new or amended test procedures developed by General Motors for which there is limited historic test data. BOI applicability to dexos® formulations for specific tests is described below and is ultimately at the discretion of GM. Test data used to qualify oils under a superseded engine oil category of any kind cannot be used to support BOI for dexos® license application.

API 1509 BOI Exceptions

- ASTM D6709-15a (Sequence VIII)
  - Test must be run on all final formulations
- ASTM D8256 (Sequence VH)
  - Test must be run on all final formulations
- ASTM D8114/8226 (Sequence VIE/VIF)
  - Equation F.I.O is not permitted

GM Case-by-case basis

- GMW 17299 (GMTC) -Turbo Coking-BOI is permitted if all the following conditions are met for the candidate relative to the tested oil: DI ≥, VM≤ , Booster ≤ , FM≤ , Moly ≤ . Total Friction Modifier (TFM) content must be equal to or less than tested.

BOI not-permitted — test must be run on final formulation for:

- GMW 17043 (GMOD) -Oxidation and Deposits
- GMW I7295 (GMAER) -Aeration
- GMW 18307 (GMOEE) -Oil Energy Efficiency
- GMW 18299 (GMSPI) – Stochastic Pre-Ignition

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Rules

C	Viscosity Grade Read Across (VGRA)

Viscosity Grade Read Across (VGRA) is offered to dexos® oil formulators for flexibility in formulating various viscosity grades using the same additive package. VGRA reflects the current state of knowledge in the industry and GM's experience with previous dexos® formulations.

API VGRA (API 1509) is permitted for ASTM/CEC tests conducted to qualify dexos® oil formulations under the new dexos1™ Gen 3 :2020 specification. However, test results used to qualify oils under a superseded engine oil category of any kind will not be permitted to be used for VGRA. VGRA is generally not applicable for new test procedures developed by General Motors for which there is little historic data. VGRA applicability to formulations for specific tests is described below:

API 1509 VGRA exceptions

- ASTM D6593 (Sequence VH)
  - all final formulas must be run
- ASTM D8114/8226 (Sequence VIE, VIF)
  - Use of equation F.1.0 is not permitted.
  - VGRA outside of viscosity Grade (e.g. 5W-30 to 0W-20) is not permitted
- ASTM D6709 (Sequence VIII)
  - All final formulas must be run

GM
Considered on a case by case basis:

- GMW 17299 (GMTC) -RA is permitted if all the following conditions are met for the candidate relative to tested oil (DI ≥, VM ≤, Booster ≤, TFM≤, Moly ≤) Candidate Total Friction Modifier (TFM) content must be equal to or less than tested.
- GMW 17295 (GMAER) -RA is permitted from a lower viscosity grade oil to a higher viscosity grade oil (e.g. 5W-20 reads to 5W-30) of same chemistry and composition.

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Rules

- GMW17043 (GMOD) - RA is permitted if the following conditions are met for the tested formula (PVIS < 44%, WPD >6.2) and for the candidate relative to tested oil (KV 100 ≥, DI ≥, VM ≤).

VGRA not-permitted — test must be run on final formulation for:

- GM 18289 (GMSPI) -must be run on all final formulas
- GM 18307 (GMOEE)- must be run on all final formulas

Use of Level 2 Support

1. Results from a superseded engine oil category

GM does not permit read-across from old versions to new versions of a test (i.e., VG to VH, GMSPI to GMSPI3, etc.) for purposes of Level 2 support.

2. Bracketing with a booster for GM tests and Sequence VIII

For unaltered GM tests and Sequence Vlll, the bracketing approach will be permitted for boosters (single purpose/single chemistry). Bracketing must be done within a viscosity grade. To utilize bracketing the proposed low and high level treat rates must be defined and run to establish the range and read across capability for the specified booster/chemistry. Formulations containing the low and high level of booster must pass and each must be capable of standing on their own as final formulas in all respects. If these conditions are met, read across may be utilized for levels within the bracketed range for the tested chemistry and specified purpose. (Subject to General Rules 6 & 7 above)

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Rules

GM MTEP/MTAC

Engine Test MTEP/MTAC Application Rules	
	For GM test that allow MTEP/MTAC no more than three runs allowed on any formulation

Test	GM Test MTAC Rule
GMTC	Must have two passing consecutive tests. Must use 3 total runs (including failed run) on same formulation to average data. No more than 3 total runs on a formulation
GMAER	Not permitted
GMSPI	Must have two passing consecutive tests. Must use 3 total runs (including failed run) on same formulation to average data. No more than 3 total runs on a formulation
GMOEE	Average of two consecutive runs to MTAC. No more than three (3) total runs on a formulation.
GMOD	Failure on WPD and PVIS requires use of three consecutive runs for MTAC (including failed run). All other spec limited properties only require two consecutive runs for MTAC. No more than three (3) total runs on a formulation.
MTM	NA

Test	API/ASTM/CEC Exceptions
VH	Not Permitted
IV	Not Permitted
X	Not Permitted
VIII	Permitted on bearing weight loss. Not permitted on Stripped Viscosity.

These Rules may be modified at any time as new information, specification limits and tests are introduced. The latest version must always be used and applied. All citations of publication or revision dates and versions of standards, guidelines, codes of practice, specifications, tests and the like are for reference only. The most current version is always controlling and shall be applied where and when applicable. GM will endeavor to recognize and support general industry practice with regard to application and purview of industry guidelines and codes of practice and the like but retains the right to be the final arbiter of where, when and how they can and will be applied with respect to dexos® licensure.

Release and Revision History

Revision #	Date	Description
1	9/1/2020	Initial release
2	9/16/2020	Revised GMOEE BOI/VGRA and MTAC, various other minor clarifications
3	4/22/2021	Remove paragraph 3 of “Level 2 support” section

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3	4/22/2021	Corrected directional indicator KV100 “>” for GMOD VGRA
3	4/22/2021	Revised General Rule #8 to include MTAC clarification
3	4/22/2021	Updated GMSPI MTAC
3	4/22/2021	Removed level 2 support -rule 3-redundant
3	4/22/2021	Revised Gen Rule #9
3	4/22/2021	Corrected directional indicator for KV for GMOD VGRA
4	8/2021	GMTC FM RA indicator added
4	11/2021	Bracketing rules clarification
4	11/2021	Gen Rule TC requirement added
5	6/2023	Gen Rule #10 added